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Shemitz et al.

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(54) **ASYMMETRIC DISTRIBUTION LUMINAIRE**

(75) Inventors: **Sylvan R. Shemitz**, Woodbridge, CT (US); **Paul R. Ford**, Orange, CT (US)

(73) Assignee: **Sylvan R. Shemitz Designs, Inc.**, West Haven, CT (US)

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This patent is subject to a terminal disclaimer.

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(22) Filed: **Aug. 20, 2003**

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Related U.S. Application Data

(63) Continuation of application No. 09/851,409, filed on May 8, 2001, now Pat. No. 6,652,118.
(60) Provisional application No. 60/202,484, filed on May 8, 2000.

(51) **Int. Cl.**[7] **F21V 17/02**
(52) **U.S. Cl.** **362/225**; 362/283; 362/285; 362/319
(58) **Field of Search** 362/217, 219, 362/220, 225, 260, 283, 285, 301, 319, 322

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Primary Examiner—John Anthony Ward
(74) *Attorney, Agent, or Firm*—Fish & Neave LLP; Garry J. Tuma

(57) **ABSTRACT**

Linear luminaires that asymmetrically distribute emitted and reflected light are presented. These luminaires have single or twin unit fluorescent lighting and optional uplighting. Each includes an elliptical baffle assembly and at least one independently adjustable reflector enclosed within the housing of the luminaire. The adjustable reflector is adjustable through at least about 15° of rotation and is at least partially hidden from view by the housing and baffle assembly. The luminaires can be surface mounted, suspended, or cantilever mounted, and include wireways to permit wiring to be run discreetly inside and through adjacent asymmetric distribution luminaires.

19 Claims, 11 Drawing Sheets

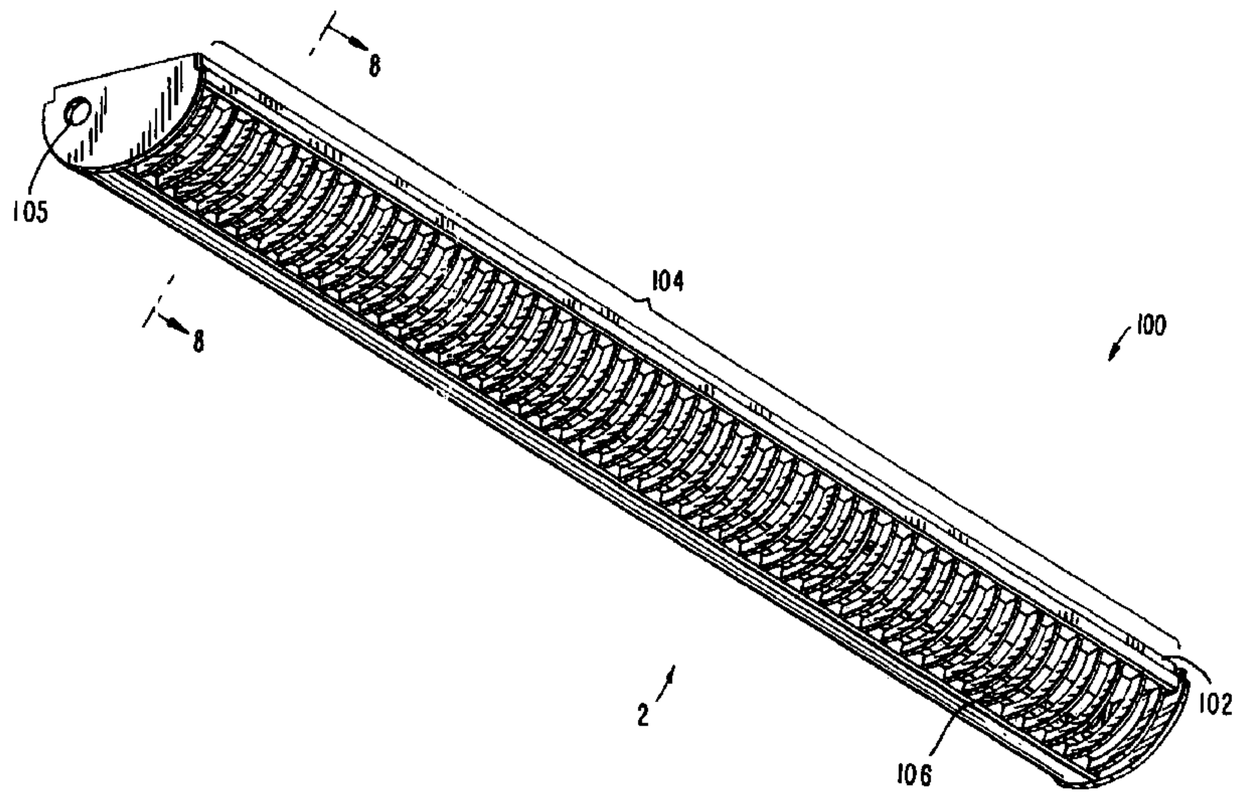
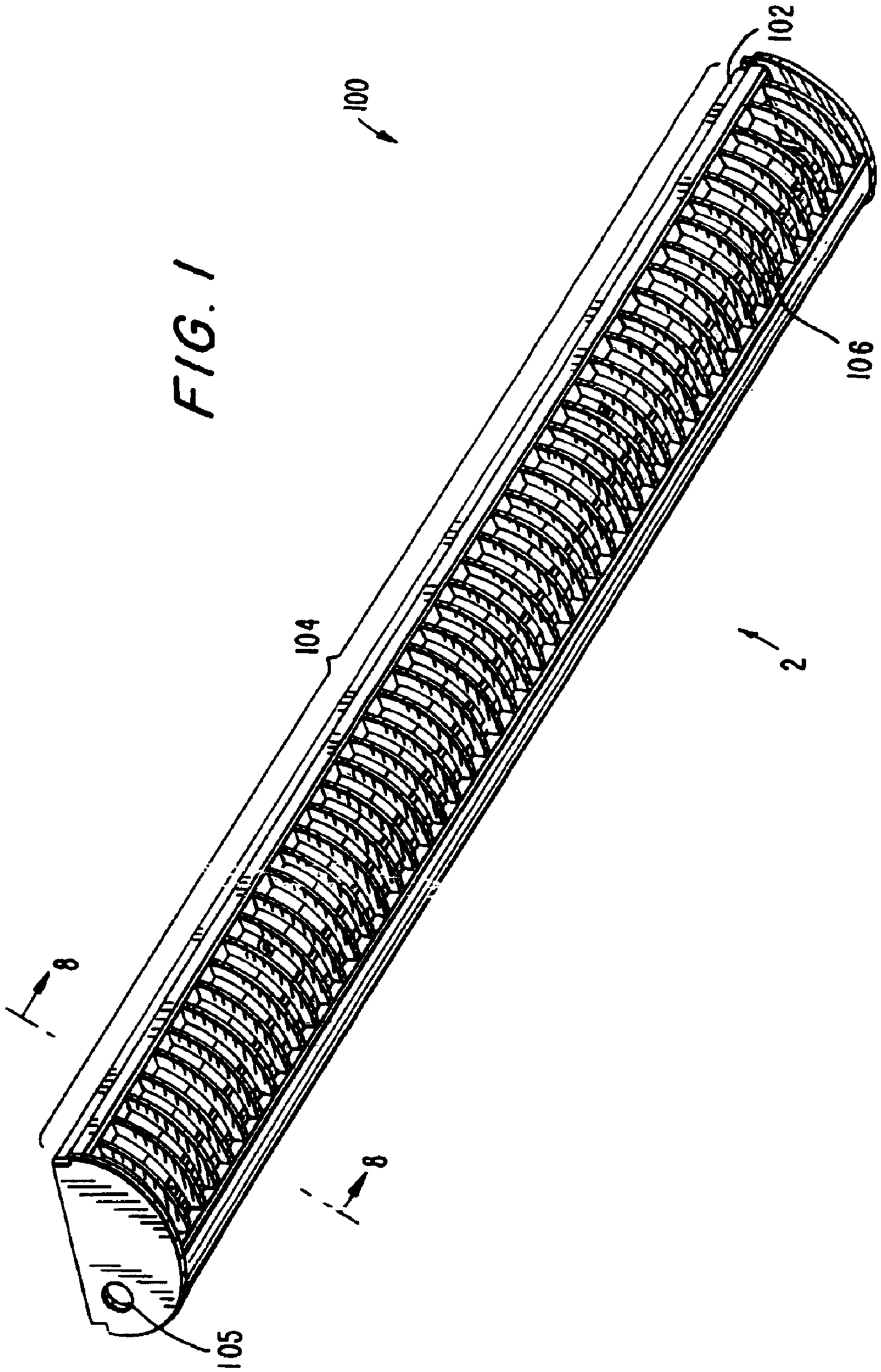


FIG. 1



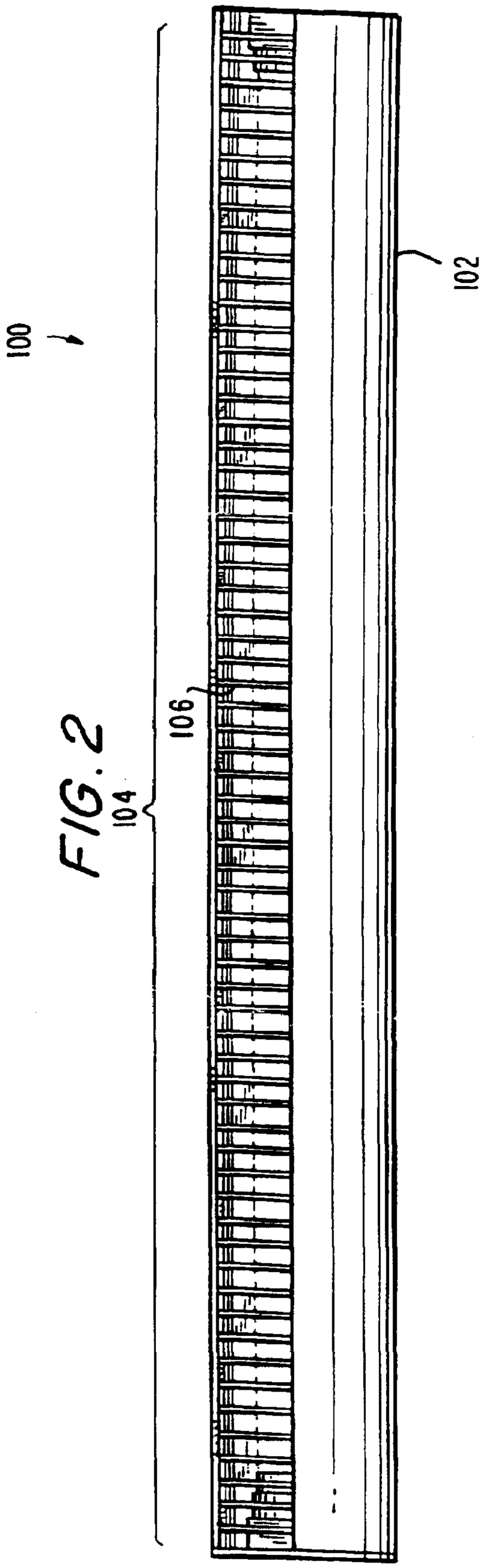


FIG. 2

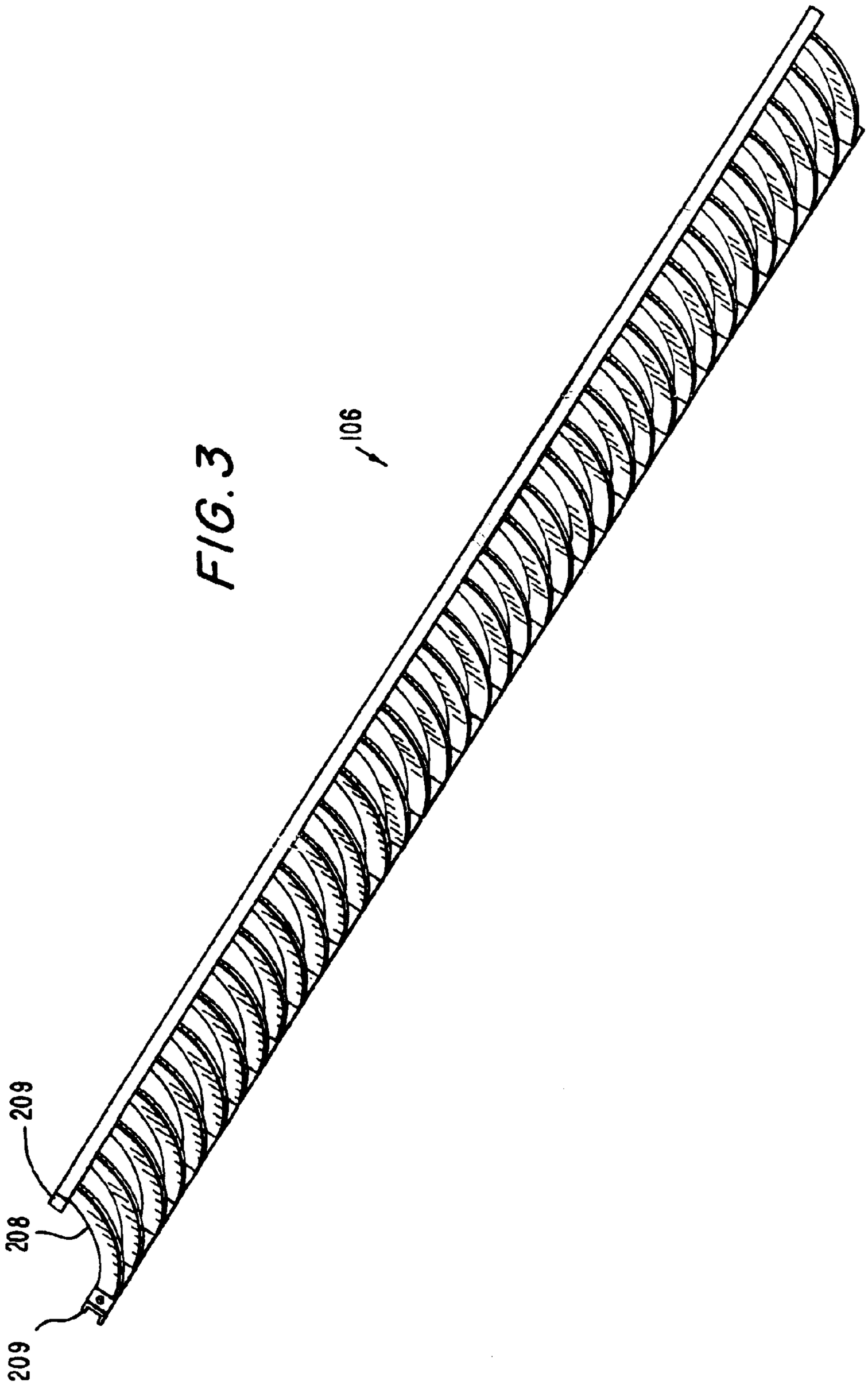
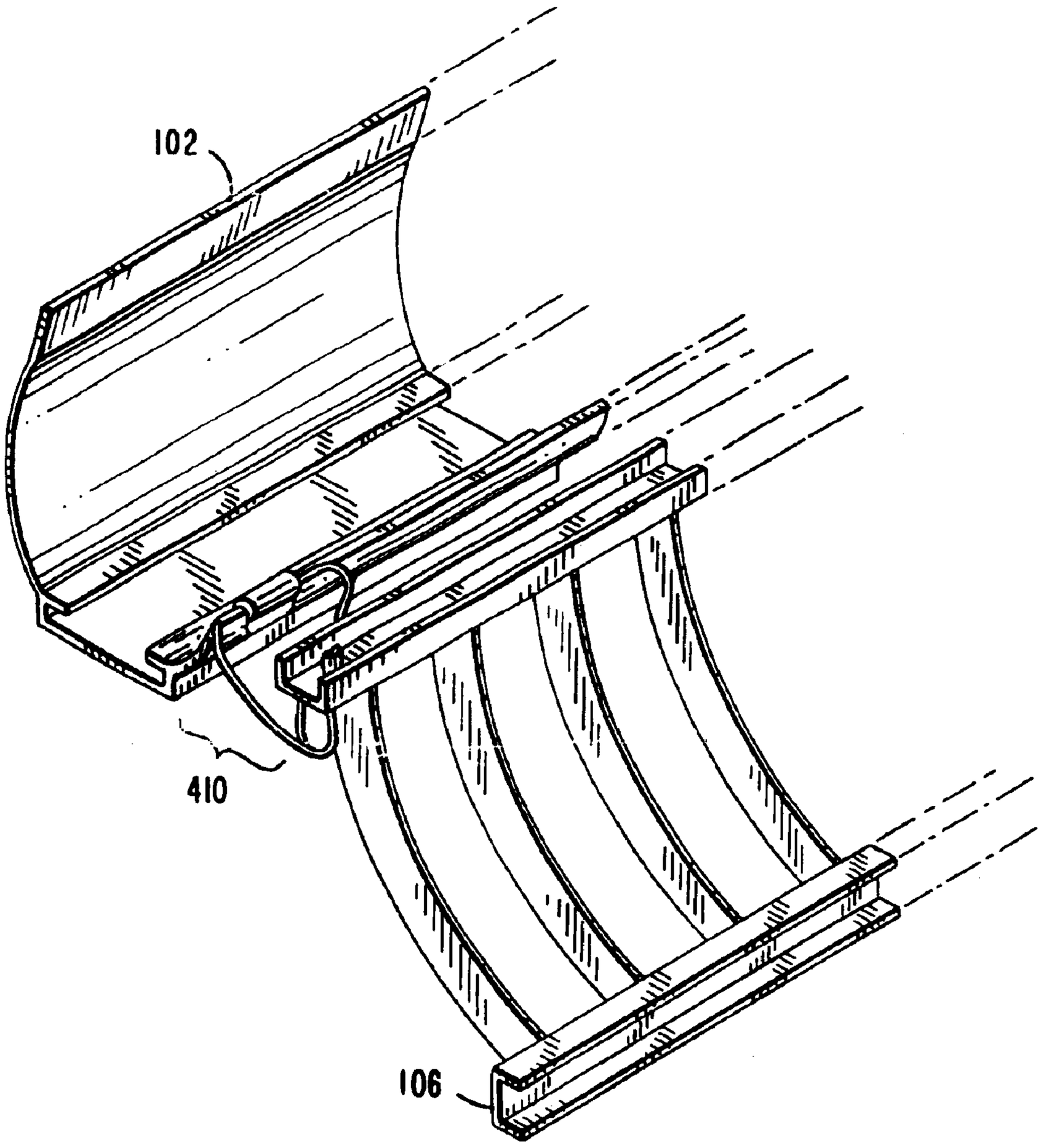


FIG. 3

FIG. 4



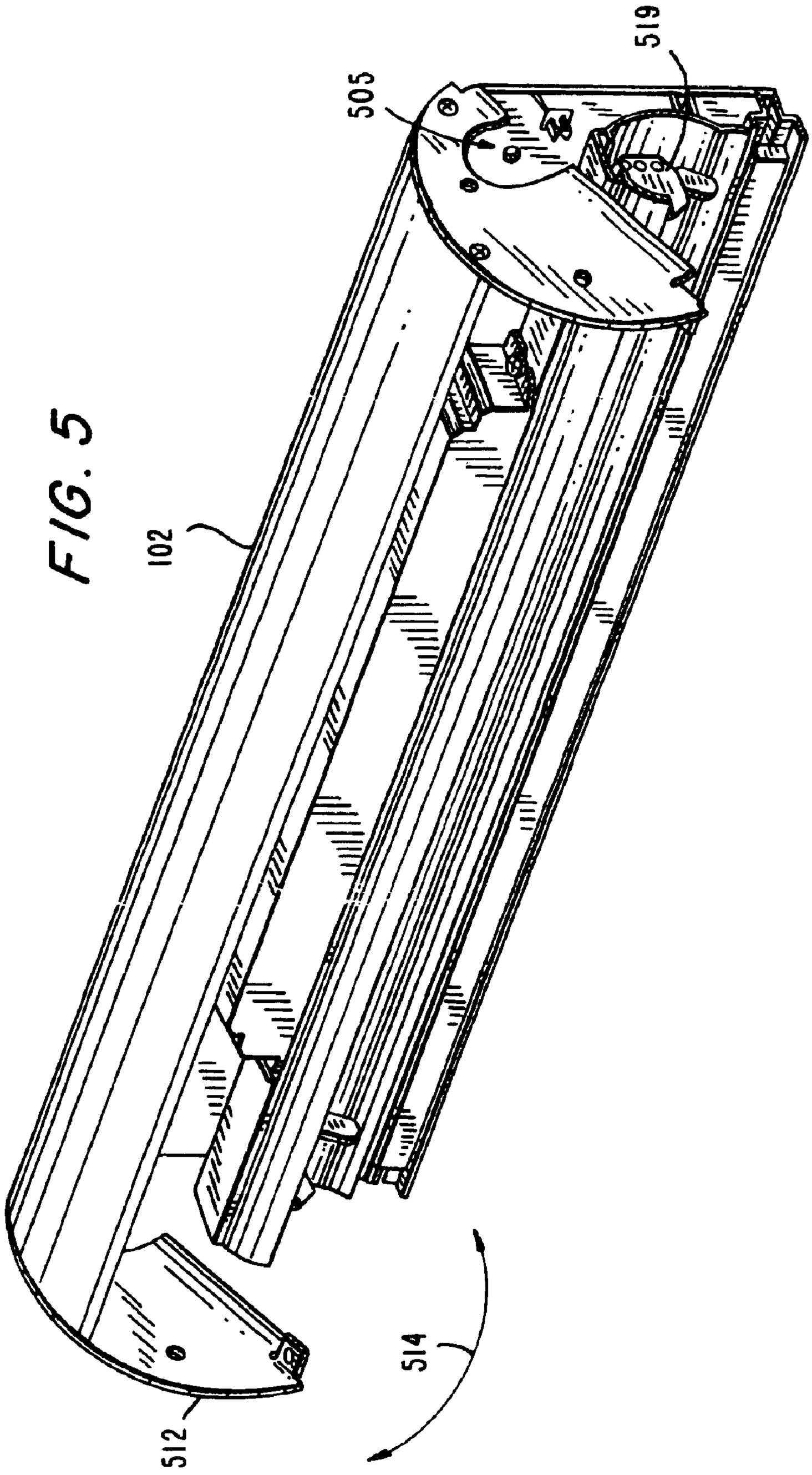


FIG. 5

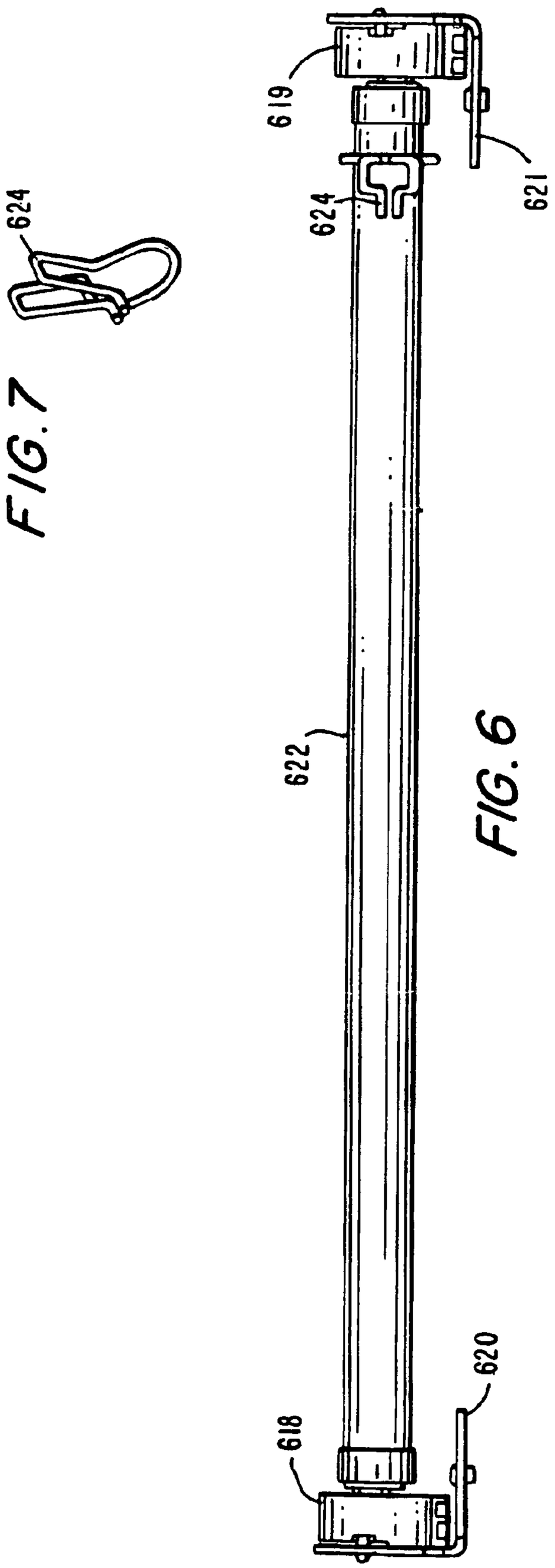


FIG. 6

FIG. 7

FIG. 8A

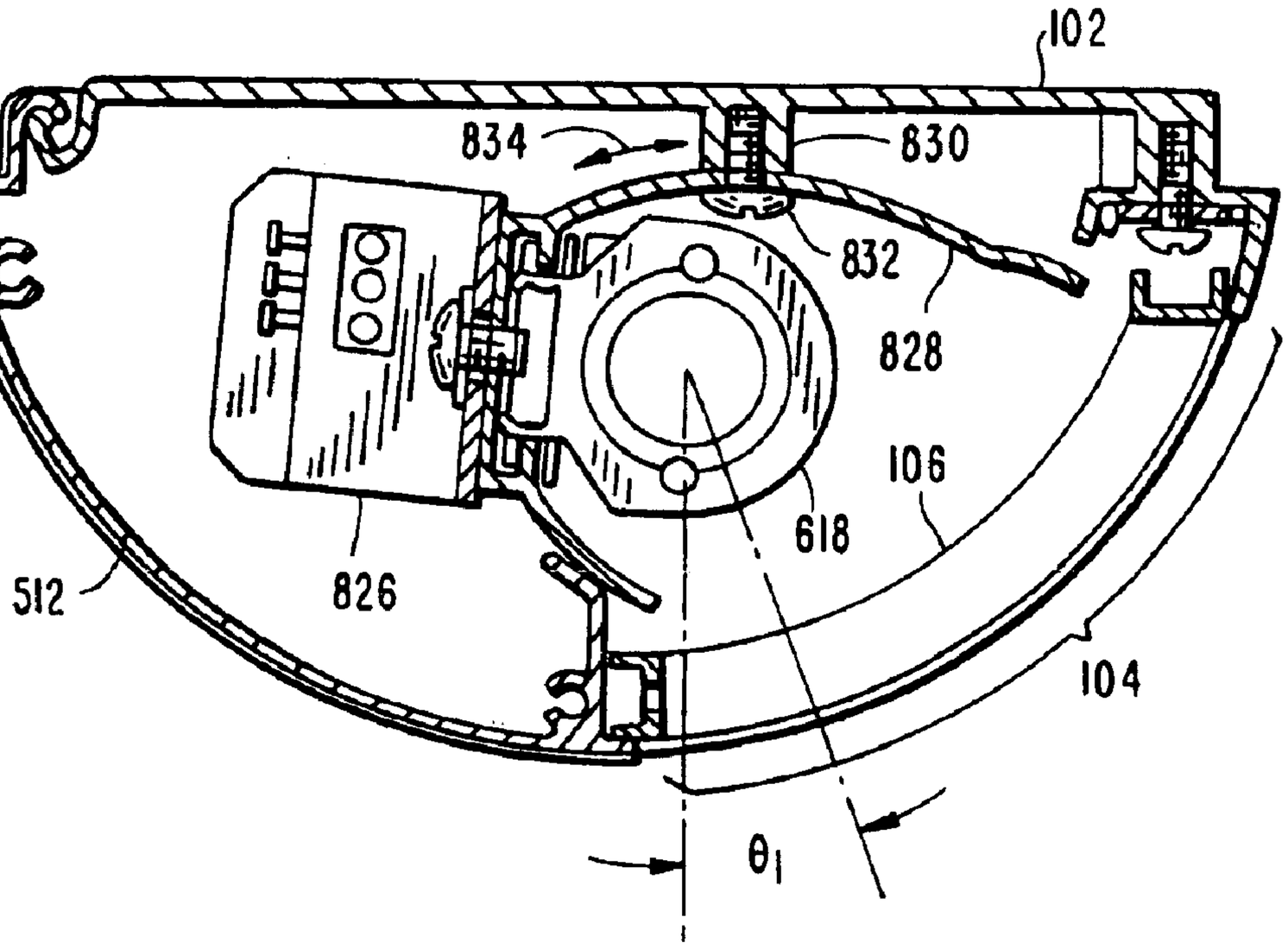
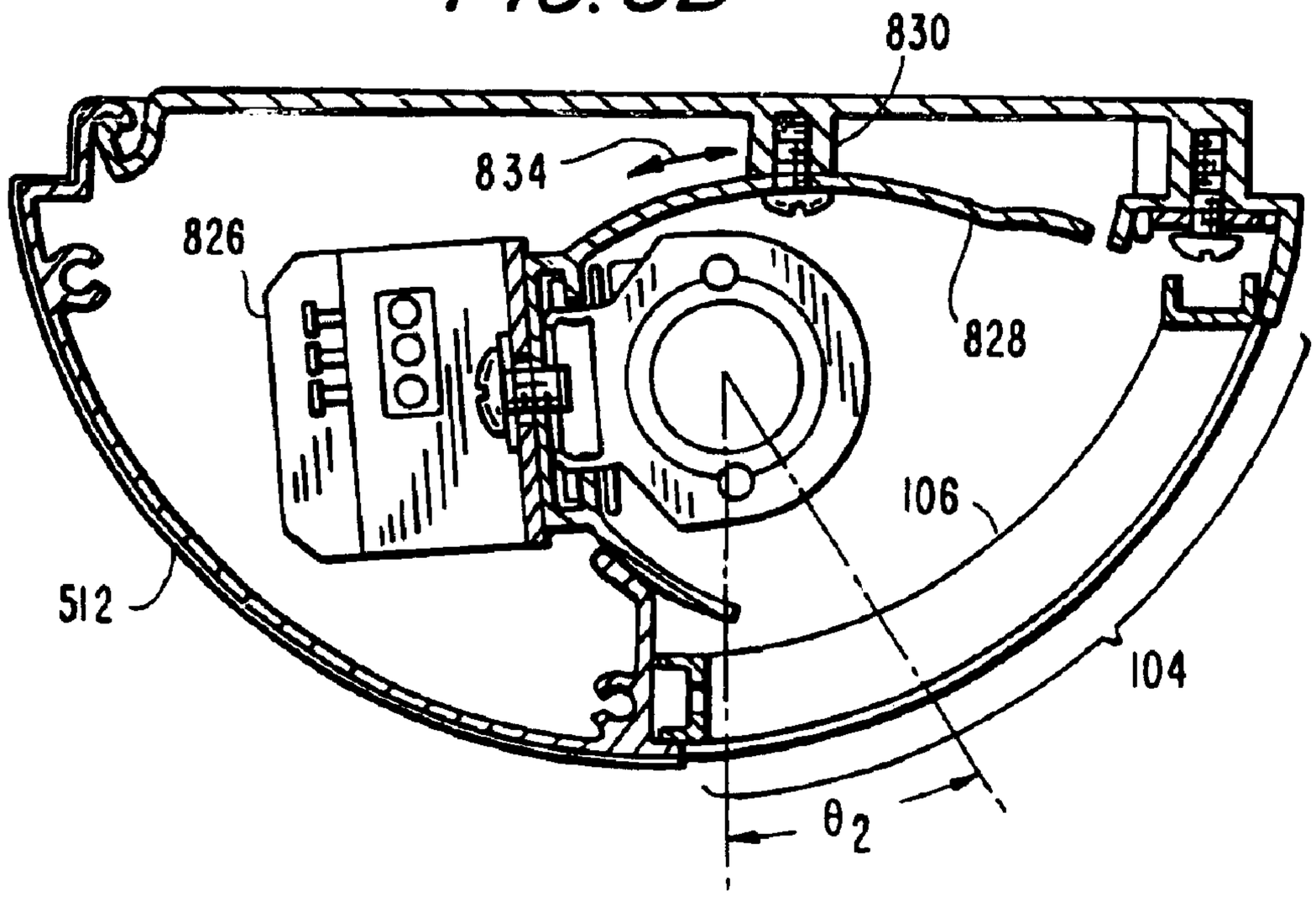

102
834
830
832
828
106
618
826
512
104
θ1

FIG. 8B


830
834
826
828
106
512
104
θ2

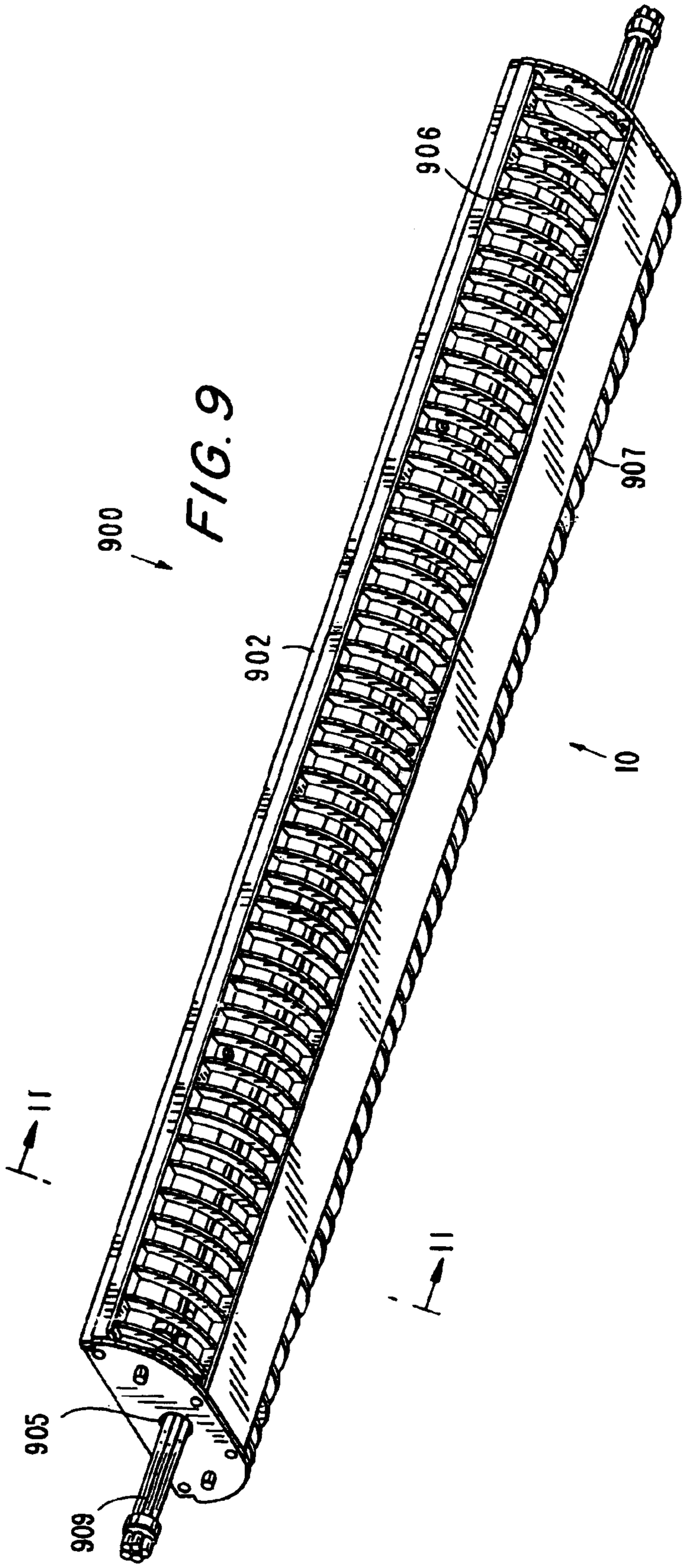
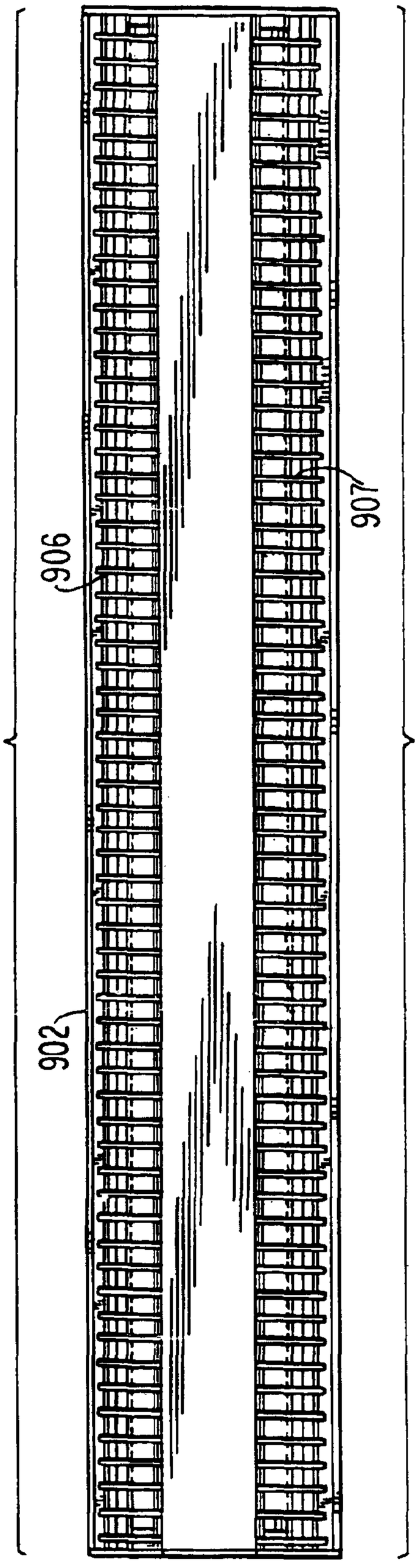


FIG. 9

FIG.10



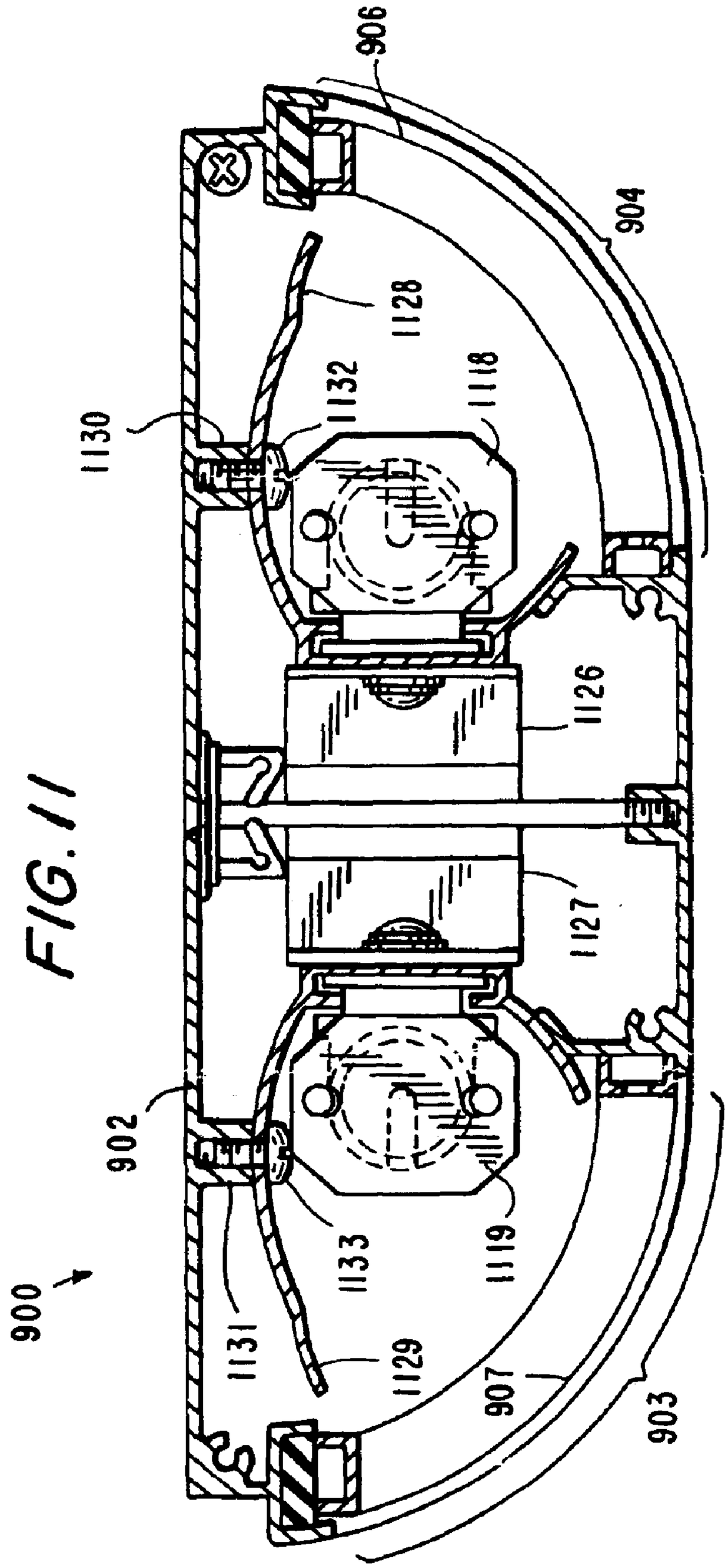

906
904
1128
1132
1118
1130
1126
1127
902
1133
1119
1131
1129
907
903
900

FIG. 11

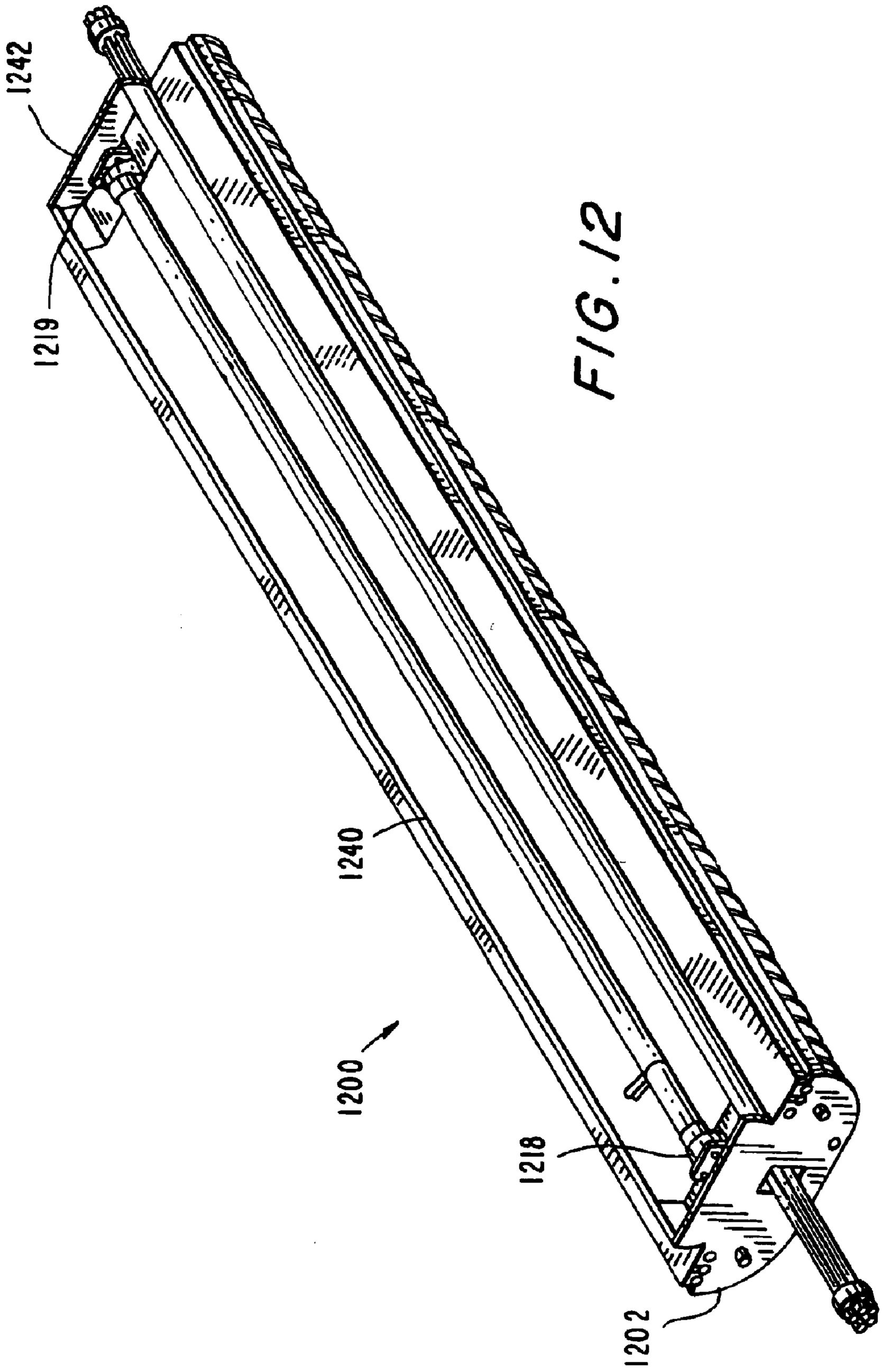


FIG. 12

ASYMMETRIC DISTRIBUTION LUMINAIRE

CROSS REFERENCE TO RELATED APPLICATIONS

This is a continuation of U.S. patent application Ser. No. 09/851,409, filed May 8, 2001, now U.S. Pat. No. 6,652,118, which is incorporated by reference herein in its entirety and claims the benefit of U.S. Provisional Application No. 60/202,484, filed May 8, 2000.

BACKGROUND OF THE INVENTION

This invention relates to linear luminaires having asymmetric light distribution. More particularly, this invention relates to linear luminaires having asymmetric light distribution that include internal adjustable reflectors.

Linear luminaires (e.g., fluorescent luminaires) that distribute light non-uniformly, that is, the intensity of the light emitted and reflected outward from the luminaire is not the same in all directions, some portions having higher intensities than other portions, have asymmetric light distribution. Such light distribution allows a wall or ceiling to be evenly or uniformly "washed" (i.e., illuminated) by having light with the highest intensity directed to those portions of the wall or ceiling farthest from the luminaire.

A disadvantage of known linear asymmetrical distribution luminaires is that their reflectors are typically in a fixed position. Reflectors play an important role in aiming light produced by the luminaire. Thus, luminaires with fixed reflectors need to be positioned precisely in order to evenly wash a desired surface because once mounted, the aim of light is fixed. Many times, however, precise positioning is just not possible because of the way in which the luminaire is to be mounted or because of the luminaire locations available relative to the surface to be washed.

Moreover, although some known linear asymmetrical distribution luminaires have adjustable reflectors, none are known to have those adjustable reflectors enclosed within the luminaire's housing. Often, such external reflectors detract from the aesthetic appearance of the luminaire, which in many applications is very important.

Furthermore, it is not known whether any linear asymmetrical distribution luminaires with twin lighting units, such as those commonly used to light both sides of a hallway, have independently adjustable reflectors enclosed within the luminaire housing to allow light exiting on each side of the luminaire to be independently aimed.

In view of the foregoing, it would be desirable to be able to provide a linear asymmetric distribution luminaire having an adjustable reflector enclosed within the housing of the luminaire.

It would also be desirable to be able to provide a linear asymmetric distribution luminaire with twin lighting units having one or more independently adjustable reflectors enclosed within the housing of the luminaire.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a linear asymmetric distribution luminaire having an adjustable reflector enclosed within the housing of the luminaire.

It is also an object of this invention to provide a linear asymmetric distribution luminaire with twin lighting units having one or more independently adjustable reflectors enclosed within the housing of the luminaire.

In accordance with this invention, a linear asymmetric distribution luminaire is provided that includes a housing having an aperture, a baffle assembly mounted to the housing over the aperture, an adjustable reflector mounted and enclosed within the housing, and an adjusting mechanism mounted within the housing and operative to adjust the reflector.

The present invention preferably includes a twin unit embodiment, each unit having an independently adjustable reflector mounted and totally enclosed within the luminaire's housing.

Advantageously, reflectors of the present invention can be adjusted without having to move or reposition the luminaire or luminaire housing. Furthermore, no other component or part of the luminaire needs to be removed in order to adjust the reflector.

Luminaires of the present invention include other features that further enhance the luminaire's versatility, such as, for example, easily removable and extendable baffle assemblies, through-wiring capabilities for side-by-side installation of continuous rows of luminaires, and optional uplighting.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. **1** is a perspective view of a single unit embodiment of an asymmetric distribution luminaire in accordance with the invention;

FIG. **2** is a plan view of the luminaire of FIG. **1** taken in the direction of arrow **2**;

FIG. **3** is a perspective view of an embodiment of the baffle assembly of the luminaire of FIG. **1** in accordance with the invention;

FIG. **4** is a partial perspective view of an embodiment of the baffle assembly mounted to the housing of the luminaire of FIG. **1** in accordance with the invention;

FIG. **5** is a perspective view of an embodiment of a housing of the luminaire of FIG. **1** in accordance with the invention;

FIG. **6** is an elevational view of an embodiment of a lamp and lampholders of the luminaire of FIG. **1** in accordance with the invention;

FIG. **7** is a perspective view of an embodiment of a lamp removal clip of the luminaire of FIG. **1** in accordance with the invention;

FIGS. **8**A–B are cross-sectional views of the luminaire of FIG. **1** taken along line **8**—**8**;

FIG. **9** is a perspective view of a twin unit embodiment of an asymmetric distribution luminaire in accordance with the invention;

FIG. **10** is a plan view of the luminaire of FIG. **9** taken in the direction of arrow **10**;

FIG. **11** is a cross-sectional view of the luminaire of FIG. **9** taken along line **11**—**11**; and

FIG. **12** is a perspective view of another embodiment of an asymmetric distribution luminaire in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. **1** and **2** show an embodiment of a single-unit linear (e.g., fluorescent) asymmetric luminaire **100** according to

the invention. Luminaire **100** includes a housing **102** having an aperture **104** along its longitudinal length and preferably an access hole **105** at preferably both longitudinal ends. Aperture **104** allows emitted and reflected light from inside housing **102** to pass outwardly there through. Access hole **105** can provide access to a power source and allows luminaire and other wiring to be routed there through to facilitate, for example, the installation of a continuous row of adjacent luminaires. Access hole **105** advantageously permits luminaire and other wiring to be discreetly run inside and through side-by-side luminaires, resulting in a safe operating environment (i.e., very little or substantially no exposed wiring) and an aesthetic appearance. Alternatively, access hole **105** can be a knockout. Housing **102** can also include other wiring access holes located, for example, along its upper flat portion.

Luminaire **100** preferably includes a preferably elliptical baffle assembly **106** mounted to housing **102** over aperture **104**. As shown in FIG. **3**, baffle assembly **106** is preferably a separate unit that preferably includes a plurality of parallel blades **208**. Blades **208** may be, for example, flat or contoured. Also, blades **208** at each end of baffle assembly **106** are spaced from edges **209** preferably ½ the spacing between adjacent blades **208** to allow two baffle assemblies **106** to be installed adjacent to each other to provide uniform baffle blade spacing on longer luminaires having multiple baffle assemblies. Baffle assembly **106** provides longitudinal shielding from an observer's viewpoint of the internal brightness of the luminaire's lamp and reflector (described further below).

Baffle assembly **106** preferably mounts to housing **102** with a baffle retainer assembly **410** as shown in FIG. **4**. By pushing up on baffle assembly **106**, retainer assembly **410** allows the bottom edge of baffle assembly **106** to swing out. Retainer assembly **410** thus allows baffle assembly **106** to be easily removed without tools. Luminaire **100** can therefore be easily re-lamped, cleaned, serviced, etc.

Housing **102** preferably has a hinged section **512** that moves in the directions of arrow **514** to provide access to the inside of housing **102** as shown in FIG. **5**. This is advantageous for installing, servicing, or replacing internal components such as, for example, ballasts, lamps, lampholders **519**, wiring and wiring connections, etc.

FIG. **6** shows a pair of lampholders **618**,**619** and respective mounting brackets **620**,**621** holding a fluorescent lamp **622**. Lampholders **618**,**619** are mounted within housing **102**, and fluorescent lamp **622** is preferably a T-5 fluorescent lamp. Such fluorescent lamps have a ⅝" (1.6 cm) diameter, and are thus smaller than the traditional T12 fluorescent lamps, which have a 1.5" (3.8 cm) diameter, and the T8 fluorescent lamps, which have a 1" (2.5 cm) diameter. This allows the overall size of luminaire **100** to be much more compact than linear luminaires using larger diameter lamps. To facilitate installation and removal of fluorescent lamp **622**, at least one lamp removal clip **624** is preferably included in luminaire **100**. FIG. **7** shows another view of lamp removal clip **624**.

As shown in FIGS. **8**A–B, luminaire **100** also includes a preferably electronic ballast **826**, an adjustable reflector **828**, and an adjusting mechanism **830** mounted within housing **102** according to the invention. Adjustable reflector **828** is preferably totally enclosed within housing **102** and is for the most part hidden from view by housing **102** and baffle **106**. Advantageously, reflector **828** can be adjusted without having to remove any other components or parts of luminaire **100** and without having to move housing **102** or the mounting position of luminaire **100**. Reflector **828** is adjustable preferably by loosening screw **832** and then moving the reflector in one of the directions of arrow **834** via a slot preferably milled in the reflector. This reflector movement can be described as being about a longitudinal axis that runs substantially parallel to the longitudinal axis of reflector **828**. Upon loosening screw **832**, reflector **828** can be moved, for example, by merely pushing against an edge of reflector **828** with, for example, a screwdriver. A screwdriver, or other similar tool, could also be used to move reflector **828** by inserting that tool in an optionally provided slotted hole on reflector **828** (not shown). Alternatively, other suitable adjusting mechanisms can be used, such as, for example, a hinge or pivot mechanism.

The degree of adjustability of reflector **828** is preferably at least about 15°. FIGS. **8**A–B illustrate angles θ**1** and θ**2**, which represent zones of outputted light from luminaire **100** having the highest intensity (i.e., candlepower). Angle θ**1** is preferably about 20° (and is conventionally measured from nadir, generally accepted to be in a direction vertically downward), while angle θ**2** is about 35°, which represents about a 15° adjustable window controlled by reflector **828**. The degree of adjustability can be alternatively less than or greater than the preferred 15° window. The maximum degree of adjustability is limited by either the angular size of aperture **104**, which as shown is almost about 100°, the size of reflector **828** relative to its spacing from housing **102** and baffle **106**, or the manner in which ballast **826** is mounted within housing **102**, and if mounted to reflector **828** as shown, the ballast's spacing from housing **102**.

Light emitted and reflected outward from luminaire **100** through aperture **104** is asymmetrically distributed such that, for example, vertical or horizontal surfaces can be uniformly "washed" with light, the highest intensity light being aimed near the portion of the washed surface farthest away from the luminaire. Luminaire **100** also can be advantageously positioned to distribute light downwards, upwards, or sideways. Moreover, the adjustable reflector permits the highest intensity light (i.e., light having maximum candlepower) to be variably aimed.

FIGS. **9** and **10** show a twin-unit embodiment of a linear asymmetric distribution luminaire **900** in accordance with the present invention. Luminaire **900** is particularly advantageous for downward washing of vertical surfaces and includes two back-to-back lighting units each with a separate, preferably independently adjustable reflector preferably totally enclosed within a housing **902**. Housing **902** has an aperture **903**, an aperture **904**, and an access hole **905**. Apertures **903** and **904** permit light to exit from each respective side of luminaire **900**. Access hole **905**, which can alternatively be a knockout, permits wiring to be routed there through to facilitate, among other things, side-by-side installation of luminaires of the present invention. Preferably, luminaire **900** includes modular through-wiring harnesses **909** with quick connectors to further facilitate installation and powering of side-by-side luminaires. Such modular through-wiring harnesses and quick connectors are also optionally included in luminaire **100**.

Luminaire **900** also preferably includes preferably elliptical baffle assemblies **906** and **907** mounted to housing **902** and respectively positioned over apertures **904** and **903**. Baffle assemblies **906** and **907** each preferably include a plurality of parallel blades and can be the same as, or similar to, baffle assembly **106**.

As shown in FIG. **11**, luminaire **900** further includes lampholders **1118** and **1119**, preferably electronic ballasts **1126** and **1127**, independently adjustable reflectors **1128** and **1129**, adjusting mechanisms **1130** and **1131**, and screws **1132** and **1133**, all enclosed within housing **902**. Lampholders **1118** and **1119** each hold a fluorescent lamp, which is preferably a T5 fluorescent lamp. Adjusting mechanisms **1130** and **1131** alternatively can be other types of suitable adjusting mechanisms, such as, for example, hinged or

pivoted adjusting mechanisms. And, reflectors **1128** and **1129** are each preferably adjustable in the same manner and to the same degree, and have the same advantages, as reflector **828** of luminaire **100**. Furthermore, reflectors **1128** and **1129** are each adjustable independent of the other.

FIG. **12** shows another embodiment of a linear asymmetrical luminaire in accordance with the invention. Luminaire **1200**, which is similar to luminaire **900**, includes an uplighting unit **1240**. Uplighting unit **1240** has a pair of lampholders **1218** and **1219** mounted on an outside surface of housing **1202**. Lampholders **1218** and **1219** hold preferably a T5 fluorescent lamp. Uplight reflector **1242** reflects light upward and outward to evenly illuminate, for example, a ceiling. Uplighting unit **1240** advantageously requires only a short setback distance from a surface to broadly "wash" that surface. Accordingly, luminaire **1200** is preferably installed a distance away from a ceiling to provide light in three general directions.

In another embodiment of the present invention (not shown), luminaire **100** has uplighting unit **1240** mounted on housing **102**.

Luminaires of the present invention can be suspended (e.g., with cables from a ceiling or beam such that the luminaire is a distance away from the ceiling or beam), surface mounted (e.g., directly to a ceiling or wall), cantilever-mounted (e.g., outward from a wall or shelving structure), or pendent or stem mounted (e.g., from a ceiling or other structure or surface such that the luminaire is a distance away from the ceiling or other structure or surface).

Luminaires of the present invention are particularly advantageous for illuminating the vertical surfaces of, for example, merchandise in stores and books in libraries, and the adjustability of their reflectors to particularly aim produced light further enhances their versatility.

Thus it is seen that linear asymmetric distribution luminaires having at least one adjustable reflector enclosed within the housing of the luminaire are provided. One skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of illustration and not of limitation, and the present invention is limited only by the claims which follow.

We claim:

1. A linear luminaire comprising:

a housing having an aperture;

a reflector mounted and enclosed within said housing, said reflector rotatably adjustable;

a ballast mounted and enclosed within said housing, said ballast rotatably adjustable; and

an adjusting mechanism operative to rotatably adjust simultaneously said reflector and said ballast.

2. The luminaire of claim **1** wherein said reflector and said ballast are connected to each other.

3. The luminaire of claim **1** wherein said adjusting mechanism includes a screw engaging said reflector to secure said reflector in one position and to release said reflector for rotatable repositioning in another position.

4. The luminaire of claim **3** wherein said positions are between 0° and 15° apart.

5. The luminaire of claim **1** wherein said adjusting mechanism comprises a hinge.

6. The luminaire of claim **1** wherein said reflector is rotatably adjustable about an axis substantially parallel to the longitudinal axis of said reflector.

7. The luminaire of claim **1** wherein said reflector is rotatably adjustable through about 15° of rotation about an axis substantially parallel to the longitudinal axis of said reflector.

8. The luminaire of claim **1** further comprising a baffle assembly mounted to said housing and positioned over said aperture, said baffle assembly including a plurality of parallel blades.

9. The luminaire of claim **1** wherein said housing comprises a hinged section that provides access to at least a portion of the inside of said housing.

10. The luminaire of claim **1** wherein said housing includes at least one access hole at a longitudinal end of said housing to allow wiring to be routed there through and to permit side-by-side placement of another said luminaire with wiring running discreetly through and between said luminaires.

11. The luminaire of claim **1** further comprising a pair of lampholders operative to hold a fluorescent lamp, said lampholders mounted on an outside surface of said housing.

12. The luminaire of claim **1** further comprising a pair of lampholders operative to hold T-5 fluorescent lamp, said lampholders mounted within said housing.

13. A linear luminaire comprising:

a housing having an aperture;

a baffle assembly mounted to said housing and positioned over said aperture, said baffle assembly including a plurality of parallel blades;

a reflector mounted and enclosed within said housing, said reflector rotatably adjustable;

a lampholder mounted and enclosed within said housing, said lampholder rotatably adjustable; and

an adjusting mechanism operative to rotatably adjust simultaneously said reflector and said lampholder.

14. The luminaire of claim **13** wherein said reflector and said lampholder are connected to each other.

15. The luminaire of claim **13** wherein said lampholder is operative to hold a T-5 fluorescent lamp.

16. The luminaire of claim **13** wherein said adjusting mechanism includes a screw engaging said reflector to secure said reflector in one position and to release said reflector for rotatable repositioning in another position.

17. The luminaire of claim **13** further comprising a second lampholder mounted within said housing, said first and second lampholders operative to hold a T-5 fluorescent lamp.

18. The luminaire of claim **13** further comprising a pair of lampholders mounted on an outside surface of said housing, said pair of lampholders operative to hold a fluorescent lamp.

19. A linear luminaire comprising:

a housing having an aperture;

a baffle assembly mounted to said housing and positioned over said aperture, said baffle assembly including a plurality of parallel blades;

a reflector mounted and enclosed within said housing, said reflector rotatably adjustable;

a ballast mounted and enclosed within said housing, said ballast rotatably adjustable;

a pair of lampholders mounted and enclosed within said housing, said lampholders rotatably adjustable; and

an adjusting mechanism operative to rotatably adjust simultaneously said reflector, said ballast, and said lampholders.

* * * * *